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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/508,881	04/26/2005	Nicolas Zartenar	1943-045073	3732

28289 7590 02/27/2008

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EXAMINER	
YOUNG, NATASHA E	
ART UNIT	**PAPER NUMBER**
1797	

MAIL DATE	DELIVERY MODE
02/27/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/508,881	ZARTENAR ET AL.	
	Examiner	Art Unit	
	NATASHA YOUNG	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *22-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *22-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 22-32 and 35-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abe (EP 0 913 357 A1) in view of DeBellis et al (US 2002/0000067 A1).

Regarding claim 22, Abe teaches a device for the generation of hydrogen (see Abstract), comprising: a. a heated steam reformation stage with a reformer catalyst for converting gaseous or vaporizable hydrocarbons and water into hydrogen, carbon monoxide and further reformation products, wherein the steam reformation stage is embodied as a hollow body, with a shell chamber embodied as an chamber for housing a reformer catalyst, and a heating device that is arranged in the shell chamber; b. at least one stage that is arranged downstream of the steam reformation stage for catalytic conversion of the mixture of hydrogen, carbon monoxide, and excess water steam (shift step) emanating from the steam reformation stage, wherein the conversion stages are embodied as a hollow body with an chamber for housing a corresponding catalyst; and c. a fine purification stage that is arranged downstream of the conversion stages for catalytic reduction of the residual carbon monoxide content of the conversion products, wherein the fine purification stage is embodied as a hollow body with an chamber for housing the corresponding catalyst, and wherein the annular chamber of the fine purification stage directly connects to the annular chamber of the conversion stage on the fine purification stage side, wherein the chamber of the conversion stage on the steam reformation stage side directly connects to the chamber of the steam reformation stage to form a complete annular chamber of

all the stages (see Abstract; page 2, lines 13-33 and lines 39-54; page 3, lines 17-24; and figures 2-4).

Abe does not teach annular chambers.

DeBellis teaches annular catalytic chambers (see paragraphs 0069-0071 and figure 7).

DeBellis does not teach a burner.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Abe with the teachings of DeBellis et al for increased mixing and additional structural support (see DeBellis et al paragraphs 0076-0077).

Claims 23-25 depend on claim 22 such that the reasoning used to reject claim 22 will be used to reject the dependent portions of the claims.

Regarding claim 23, Abe teaches the heating device is embodied as a burner (see page 6, line 17-19).

Regarding claim 24, Abe does not teach the cross sectional thickness of the complete annular chamber is approximately 2 to 20% of the exterior diameter of the hollow body.

DeBellis et al teaches annular chamber (see paragraphs 0069-0071).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Abe with the teachings of DeBellis et al for increased mixing and additional structural support (see DeBellis et al paragraphs 0076-0077).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the annular chamber to a thickness in the approximate range of 2 to 20% of the hollow body, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

Regarding claim 25, Abe teaches the catalyst is arranged in a honeycomb structure, preferably arranged on a flow channel limiting corrugated metal foil (see Abstract and page 10, lines 28-29).

DeBellis et al teaches annular catalytic chambers which may be wavy and multi-finned (see paragraphs 0087-0088) into a honeycomb structure.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Abe with the teachings of DeBellis et al for increased mixing and additional structural support (see DeBellis et al paragraphs 0076-0077).

Claim 26 depends on claim 25 such that the reasoning used to reject claim 25 will be used to reject the dependent portions of the claim.

Regarding claim 26, Abe teaches perforations are provided between the flow channels for improving the material exchange (see page 6, lines 2-7 and page 9, lines 1-7).

Claims 27-28 depend on claim 22 such that the reasoning used to reject claim 22 will be used to reject the dependent portions of the claims.

Regarding claim 27, Abe teaches at least one flow channel is provided in the interior of the hollow body (bodies) (see figure 4).

Regarding claim 28, Abe teaches the main direction of flow of hydrogen and of the reformer products within the hollow body is preferably essentially oriented parallel to its axis (see figure 4).

Claim 29 depends on claim 28 such that the reasoning used to reject claim 28 will be used to reject the dependent portions of the claim.

Regarding claim 29, Abe does not teach the flow channel represents an annular chamber.

Claims 30-32 and 35 depend on claim 22 such that the reasoning used to reject claim 22 will be used to reject the dependent portions of the claims.

Regarding claim 30, Abe does not teach the flow channel is embodied for feeding and preheating the hydrocarbons in the opposite direction of the flow of the gaseous products coming from the conversion stages and the fine purification stage.

Abe teaches preheating the hydrocarbons and the conversion stages and the purification stage (see page 5, lines 2-11 and figure 4).

DeBellis et al teaches the flow channel is embodied for feeding and preheating the hydrocarbons in the opposite direction of the flow of the gaseous products coming from the conversion stage (see paragraph 0027-0028 and 0069-0071 and figure 7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Abe with the teachings of DeBellis et al for increased mixing and additional structural support (see DeBellis et al paragraphs 0076-0077).

Regarding claim 31, Abe teaches an indirect heat exchanger is provided at least between the conversion stages and the steam reformation stage, and possibly also between the conversion stage and the fine purification stage, through which the water required for the steam reformation is guided in counter flow of the gaseous products coming from the conversion stages and possibly also from the fine purification stage (see page 7, lines 20-33 and figure 9).

Regarding claim 32, Abe teaches the fine purification stage is embodied optionally as a selective oxidation stage (SelOx stage), or as a methanation stage (see page 5, lines 2-11).

Regarding claim 35, Abe teaches a flow guide enclosure that envelopes the conversion stages from the exterior, for a cooling medium for the cooling of the conversion stages, wherein the cooling medium preferably is water or hydrocarbons, which can be fed to the steam reformation stage in the form of steam (see page 7, lines 20-33).

Although Abe teachings a heating medium it is known to one having ordinary skill in the art at the time the invention was made that heat exchangers are using for heating and cooling a fluid.

Claims 36-38 depend on claim 35 such that the reasoning used to reject claim 35 will be used to reject the dependent portions of the claims.

Regarding claim 36, Abe teaches the flow guide enclosure contains input and output connections for the cooling medium, and is optionally designed in the equal or counter flow of the through flow direction within the conversion stages (see page 7, lines 30-33 and figure 9). Claim 24 depends on claim 22 such that

the reasoning used to reject claim 22 will be used to reject the dependent portions of the claim.

Regarding claim 37, Abe teaches that the flow guide enclosure is connected on the discharge connection side to the reformation stage (see figure 9).

Abe does not teach that the flow guide enclosure is hydraulically connected on the discharge connection side to the reformation stage.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to hydraulically connect the flow guide enclosure on the discharge connection side to the reformation stage, since it has been held that constructing a formerly integral, structure in various elements involves only routine skill in the art.

Regarding claim 38, Abe does not teach a control valve is provided as an option at the input and/or output connections of the flow guide enclosure for the mass adjustment of the flow of the cooling medium.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide a control valve as an option at the input/output connections of the flow guide enclosure for the mass adjustment of the flow of the cooling medium, since it has been held that the provision of adjustability, where needed, involves routine skill in the art.

Claim 39 depends on claim 38 such that the reasoning used to reject claim 38 will be used to reject the dependent portions of the claim.

Regarding claim 39, Abe teaches temperature sensor at the downstream end of the chamber (see figure 6, element 14a-f are the temperature sensors).

Abe does not teach that the temperature sensor is connected to the control valve for the mass adjustment of the flow of the cooling medium via an upstream control unit.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the control valve for the mass adjustment of the flow of the cooling medium via an upstream control unit, since it has been held that the provision of adjustability, where needed, involves routine skill in the art.

Claim 40 depend on claim 22 such that the reasoning used to reject claim 22 will be used to reject the dependent portions of the claim.

Regarding claim 40, Abe teaches an additional cooling medium channel is arranged in the interior of the hollow cylindrically embodied conversion stages, through which preferably and optionally water and/or the hydrocarbons can flow (see page 7, lines 20-33 and figure 9).

Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abe (EP 0 913 357 A1) and DeBellis et al (US 2003/0044331 A1) as applied to claim 32 above, and further in view of Numata et al (US 2002/0000067 A1).

Claim 33 depends on claim 32 such that the reasoning used to reject claim 32 will be used to reject the dependent portions of the claim.

Regarding claim 33, Abe does not teach an air supply that is evenly arranged across the circumference of the annular chamber of the fine purification stage.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to equip the SelOx stage of the annular chamber with an air supply since it would lead to improved purification results.

Claim 34 depends on claim 33 such that the reasoning used to reject claim 33 will be used to reject the dependent portions of the claim.

Abe does not teach the air supply is embodied as an annular manifold with distributed discharge nozzles.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to embody the air supply as an annular manifold with distributed discharge nozzles, since it has been held that the provision of adjustability, where needed, involves routine skill in the art.

Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gao (US 2002/0132147 A1).

Regarding claim 41, Gao teaches device for the generation of hydrogen (see paragraph 0001), comprising: a. a heated steam reformation stage with a reformer catalyst for converting gaseous or vaporizable hydrocarbons and water into hydrogen, carbon monoxide and further reformation products, wherein the steam reformation stage is embodied as a hollow body, with a shell chamber embodied as an annular chamber for housing a reformer catalyst, and a heating device that is arranged in the shell chamber(see paragraph 0022-0025); b. at

least one stage that is arranged downstream of the steam reformation stage for catalytic conversion of the mixture of hydrogen, carbon monoxide, and excess water steam (shift step) emanating from the steam reformation stage, wherein the conversion stages are embodied as a hollow body with an annular chamber for housing a corresponding catalyst (see paragraphs 0031-0033); and c. a third stage that is arranged downstream of the conversion stages for catalytic reduction of the residual carbon monoxide content of the conversion products, wherein the third stage is embodied as a hollow body with an annular chamber for housing the corresponding catalyst, and wherein the annular chamber of the third stage directly connects to the annular chamber of the conversion stage on the third stage side (see paragraphs 0042-0043), since the fluid has been exposed to additional purifying catalyst, wherein the annular chamber of the conversion stage on the steam reformation stage side directly connects to the annular chamber of the steam reformation stage to form a complete annular chamber of all the stages and there are no separate feed lines, discharge lines, or bypass devices between the individual stages (see paragraph 0042-0043).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teaching of Gao such that the third stage is a fine purification stage for the predictable result of more pure product or less impurities.

Response to Arguments

Applicant's arguments, see Remarks, page 6, lines 9-19, filed January 15, 2008, with respect to claims 39-40 rejected under 35 U.S.C. 112 have been fully

considered and are persuasive. The rejection of claims 39-40 have been withdrawn.

Applicant's arguments filed January 15, 2008 have been fully considered but they are not persuasive.

Regarding remarks towards the rejection of claim 22 using Abe (EP 0 913 357 A1) in view of DeBellis et al (US 2003/0044331 A1), the examiner upholds the rejection. Both references teach a reformer, a shift reaction, a burner, catalyst, and heat exchange.

Abe does not teach an annular reaction chamber.

Abe discloses a reactant fluid removed from the reactor, heated in the vaporizer (18), and returned to the reactor (see figure 8 and paragraphs 0056-0057) and that the heating medium is not restricted to reactant A such that the reactor is almost annular in design (see figure 9 and paragraphs 0058-0059). This structure shows that it would have been obvious to modify the teachings of Abe with the teachings of DeBellis et al.

DeBellis et al discloses a finned annular reactor that has the annular geometry of a fuel processing system that can be extended upstream and downstream from the basic vessel (100) to provide a heat exchanger (220) and/or other process (240) and it could be possible to integrate one or both structures (i.e., an inner structure (120)) inside and/or outside of the assembly (100) (see figure 7 and paragraphs 0069-0070).

DeBellis et al discloses a heat exchanger (22) which is interpreted as a heating device.

Although the applicant(s) invention is not based on a need for additional structural support or better mixing of the reactant, this is some of the advantages of DeBellis, which are not disclosed or taught in Abe.

The applicant(s) do not claim a heating device in conjunction with the heat-exchange design in claim 22, but DeBellis et al discloses that it is known in the art to use radiant tube burners with recuperator (heat exchangers) to boost system efficiency by transferring the unused energy in the exhaust gases to incoming combustion air (see DeBellis et al paragraph 0005).

Regarding claims 33-34, Abe does not teach an annular reaction chamber.

Abe discloses a reactant fluid removed from the reactor, heated in the vaporizer (18), and returned to the reactor (see figure 8 and paragraphs 0056-0057) and that the heating medium is not restricted to reactant A such that the reactor is almost annular in design (see figure 9 and paragraphs 0058-0059). This structure shows that it would have been obvious to modify the teachings of Abe with the teachings of DeBellis et al.

DeBellis et al discloses a finned annular reactor that has the annular geometry of a fuel processing system that can be extended upstream and downstream from the basic vessel (100) to provide a heat exchanger (220) and/or other process (240) and it could be possible to integrate one or both structures (i.e., an inner structure (120)) inside and/or outside of the assembly (100) (see figure 7 and paragraphs 0069-0070).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to embody the air supply as an annular manifold with distributed discharge nozzles, since it has been held that the provision of adjustability, where needed, involves routine skill in the art.

Also, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have distributed discharge nozzles since it was known in the art distributed discharge nozzles distribute fluid more evenly than just an inlet conduit.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Natasha Young whose telephone number is

571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NY

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797